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Terms	Documents
L5 and ((skill$ or level$ or difficul$) with (represent$ or indicat$ or symbol$ or character$) with (point or grade or letter))	9

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Search: L9

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Search History

DATE: Monday, December 23, 2002 Printable Copy Create Case

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	DB=USPT; THES=ASSIGNEE; PLUR=YES; OP=OR		
L9	L5 and ((skill$ or level$ or difficul$) with (represent$ or indicat$ or symbol$ or character$) with (point or grade or letter))	9	L9
L8	L6 and ((skill$ or level$) with difficul$ with (represent$ or indicat$ or symbol$ or character$) with (point or grade or letter))	0	L8
L7	L6 and l1	0	L7
L6	L4 and ((705/8 |705/9 |705/10)!.CCLS.)	8	L6
L5	L4 and ((705/5 |705/7 |705/8 |705/9 |705/10)!.CCLS.)	9	L5
L4	(assignment or task or service or job) and ((skill$ or level$ or difficul$) with (represent$ or indicat$ or symbol$ or character$) with (point or grade)) and @ad<=19970827	3310	L4
L3	L1 and ((skill$ or level$) same (represent$ or indicat$ or symbol$ or character$) same (point or grade))	2	L3
L2	L1 and ((check$ or determin$ or decid$ or mak$) with (timing or time))	6	L2
L1	5122959.pn. or 5177684.pn. or 5241465.pn. or 5343387.pn. or 5428546.pn. or 5737728.pn. or 5572438.pn. or 5761278.pn.	8	L1

END OF SEARCH HISTORY

L9: Entry 1 of 9 File: USPT Aug 7, 2001

DOCUMENT-IDENTIFIER: US 6272467 B1
TITLE: System for data collection and matching compatible profiles

DATE FILED (1):
19970116

Assignee Name (1):
Spark Network Services, Inc.

Assignee Group (1):
Spark Network Services, Inc. Evanston IL 02

Abstract Text (1):
This invention relates to an automated method for identifying matches between a set of predetermined traits and a set of preferences. This method can be used to find compatible matches in a variety of situation s where participants are identified by a profile of traits and a set of criteria desired in at match, including, for example, matching candidates to residency program, and matching job hunters with employment opportunities. The present invention offers advantages and improvements over prior computer matching systems because, it provides an automated, effective method for matching traits with corresponding preferences and insures that only matches of the highest degree are made. The, present invention utilizes two-way matching of selected criteria, which measures not only how compatible the potential match is with the desired traits of the user, but also how well the user fits the potential match's idea of the perfect match.

Brief Summary Text (2):
This invention relates to an automated method for identifying matches between a set of predetermined traits and a set of preferences. This method can be used to find compatible matches in a variety of situations where participants are identified by a profile of traits and a set of criteria desired in a match, including, for example, matching candidates to residency programs, and matching job hunters with employment opportunities. In the embodiment described below, the method of the invention is discussed for selecting potential dating partners based on personal traits and compatibility criteria.

Brief Summary Text (6):
Computer dating services provided a more organized method of classifying users, and of providing a way to quickly screen candidates. Those services, however, still failed to provide adequate compatible matches in many cases. Detailed information about the operation of such dating systems is not generally available, however, it is believed that most computer dating systems fall into two basic types: (1) linear matching; and (2) one-way compatibility screening.

Brief Summary Text (7):
In the first type of dating service, the person seeking a date is asked to answer a questionnaire and characterize himself or herself according to a limited set of criteria. These criteria usually include physical characteristics such as age, weight, race, and marital status, along with psychological characteristics such as extroversion/introversion. After entering this data into the computer, the computer dating service compares this new data to that already contained in the questionnaires filled out by other subscribers to find those that have similar characteristics. This similar/non-similar type of matching fails to take into account the fact that persons may place different emphasis on a trait in others than on a trait that they themselves exhibit. Moreover, this type of matching fails to

account for the fact that males and females place significantly different emphasis on the weighting of factors and also have significantly different tolerances for variability in factors.

Brief Summary Text (8):
The second type of traditional dating service solves some but not all of these problems. Such a service asks the user to fill out not just one questionnaire about their own traits, but also another questionnaire indicating the characteristics desired in a potential match. The dating service then uses the criteria specified in the second questionnaire to search through the pool of users and find potential matches. While such a method accounts for the individual desires of the person seeking a match, it fails to account for how desirable the match would find the user. Thus, while the potential match may fit the criteria of the person seeking the match, there is no attempt to determine whether the match will find the other person compatible (i.e., a two-way match). Under such a system, for example, a user who did not want to date potential matches with children would never receive a match with children, however, this same user could be used as a match for someone with children, thus resulting in an incompatible pairing.

Brief Summary Text (10):
Many of the same problems arise in compatibility screening situations outside the field of computer dating. The unorganized and non-uniform nature of ads is not limited to personal ads but is indicative of most classified ads. Thus, persons trying to match their qualifications to an employer's job criteria have faced many of the same problems. Likewise, job search firms that utilize automated screening methods have not employed numerical methods of comparing matching candidates to prospective opportunities and have failed to implement systems to adjust the matching criteria so as to maximize the likelihood of finding a compatible match. Moreover, these firms have not utilized two-way matching of relevant characteristics. Thus, for example, these systems attempt to find a job candidate based on an employer's criteria without considering the desirability of the job or opportunity from the employee's view.

Brief Summary Text (14):
Many users of dating services do not make rational choices for their ideal match given their own profile. For example, an overweight, older man may specify that he only wishes to date very thin women between 26 and 28 years old, which likely would result in few matches because the user's criteria are too restrictive. The invention therefore adjusts the criteria for the user's desired match in several respects. First, the invention adjusts the desired build of a potential match based on the user's own build. Thus, if the user was determined to have an the method of the invention would open up the build criteria to include women of thin, medium or large builds. Second, the system adjusts the age range entered by the user by approximately 15% of the user's own age, thereby increasing the number of women who may qualify as matches. A person skilled in the art will realize that other criteria can be adjusted much in the same manner by taking into account the user's own characteristics so as to maximize the likelihood of finding a compatible match.

Detailed Description Text (2):
FIG. 1 is a high-level block diagram of an embodiment of the invention. For purposes of explaining the invention, the invention will be described as it is embodied in a system used for providing computer dating and matching services using touch-tone telephones. It will be readily understood by those skilled in the art, however, that the invention is not so limited, but may be used to provide compatibility matching services using other access methods and in other fields such as matching candidates with residency programs or employment or other opportunities.

Detailed Description Text (10):
FIG. 4 is a high level flow chart of the enrollment program 2 of the preferred embodiment, through which the general operation and method of the invention in the enrollment program 2 will be explained. In general, the user initiates a call to a designated telephone number associated with enrollment in the matching service through the input means 12. Upon connecting with the system, the new caller is presented with an introduction script at step 54 explaining the service and the method by which information will be collected from the user. After this introduction, the user is asked at step 55 to enter a six-digit passcode 42 that will be used to verify the user's identity in future sessions with the system of the invention. In the preferred embodiment, this passcode 42 is composed of the last four digits of the user's telephone number and an additional two digits selected by

the user. The enrollment program 2 creates a new profile record 16 for the new user and assigns that profile record 16 a new mailbox number 14 at step 56. The user's passcode 42 is stored in the system data 19 in the user's profile record 16.

Detailed Description Text (32):
It will be understood that a system designer may select different constraint criteria without deviating from the invention. Thus, for example, in matching potential employees with job opportunities, one constraint criteria would include whether the education level in the potential employee's trait profile 17 meets the "minimum_education_level" preference in the job's preference profile 18. A program for matching candidates to residency programs would similarly generate constraint criteria based on the residency program's preferences for "past_experience" and "education_level" and the candidate's traits.

Detailed Description Text (65):
(j) Composite Heterosexual Female Education Bonus 107--The matching program 3 next checks whether the user is a female seeking to match with a male, as specified in the sexual_preference field 33 of the user's preference profile 18. If this is the case, the matching program 3 increases the Adjusted Compatibility Score by 13.2 points if the education_level 29 indicated in the potential match's trait profile 17 is greater than that indicated in the female user's trait profile 17. This compatibility score adjustment represents a behavioral science finding that heterosexual women place a premium on dating educated men.

Detailed Description Text (79):
As already noted, the principles outlined in regard to the embodiment of the invention described in the text above can be applied to different sets of demographic/psychographic data to match potential employees with jobs (relying upon user and employer preference criteria such as work experience, skills, education, geographic preferences, company size, career track, etc.), candidates with residency positions, tenants with apartments, buyers with homes, and the like. Those skilled in the art will understand the ready transferability of the invention's technology, applied in the dating area, to such other matching applications. The artificial intelligence used in the invention in such applications will, of course, be based upon known or measured relationships from demographic or other studies. For example, in the case of an home finding service, information about geographic areas near to the user's preference may, be included in the output, as well as information about more remote geographic areas with similar housing stock.

Current US Cross Reference Classification (2):
705/5

L9: Entry 1 of 9 File: USPT Aug 7, 2001

US-PAT-NO: 6272467
DOCUMENT-IDENTIFIER: US 6272467 B1

TITLE: System for data collection and matching compatible profiles

DATE-ISSUED: August 7, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Durand; Pierre E.	Chicago	IL		
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ASSIGNEE-INFORMATION:

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Spark Network Services, Inc.	Evanston	IL			02

APPL-NO: 08/ 784713 [PALM]
DATE FILED: January 16, 1997

PARENT-CASE:
This application claims the benefit of U.S. provision application Ser. No. 60/024,789 filed Sep. 9, 1996, now abandoned.

INT-CL: [07] G06 F 15/38

US-CL-ISSUED: 705/1; 705/5, 705/26
US-CL-CURRENT: 705/1; 705/26, 705/5

FIELD-OF-SEARCH: 705/1, 705/26, 707/5

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected Search ALL

	PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
☐	4348744	September 1982	White	
☐	4422158	December 1983	Galie	707/5
☐	5086394	February 1992	Shapira	705/1
☐	5122952	June 1992	Minkus	705/26
☐	5128871	July 1992	Schmitz	364/490
☐	5164897	November 1992	Clark et al.	705/1
☐	5251131	October 1993	Masand et al.	704/9
☐	5325475	June 1994	Poggio et al.	395/133
☐	5446686	August 1995	Bosnyak et al.	365/49
☐	5450504	September 1995	Calia	382/118

ART-UNIT: 275

PRIMARY-EXAMINER: MacDonald; Allen R.

ASSISTANT-EXAMINER: Patel; Jagdish

ABSTRACT:

This invention relates to an automated method for identifying matches between a set of predetermined traits and a set of preferences. This method can be used to find compatible matches in a variety of situation s where participants are identified by a profile of traits and a set of criteria desired in at match, including, for example, matching candidates to residency program, and matching job hunters with employment opportunities. The present invention offers advantages and improvements over prior computer matching systems because, it provides an automated, effective method for matching traits with corresponding preferences and insures that only matches of the highest degree are made. The, present invention utilizes two-way matching of selected criteria, which measures not only how compatible the potential match is with the desired traits of the user, but also how well the user fits the potential match's idea of the perfect match.

25 Claims, 12 Drawing figures

L2: Entry 4 of 6 File: USPT Aug 31, 1993

DOCUMENT-IDENTIFIER: US 5241465 A
TITLE: Method for determining optimum schedule in computer-aided scheduling system

US PATENT NO. (1):
5241465

Detailed Description Text (37):
In more detail, the computer-aided scheduling system of the present embodiment includes the general controller 1301, the objective data table 102, the scheduled result table 103, the schedule process trace table 104, the strategy decision table 105, the evaluation table 106, the optimization method definition table 107, the consideration time table 108, the group 109 of allocation strategy algorithms, the solution generator 110, the evaluator 111, the optimizer 112, the evaluation item selector 1302 and the evaluation item determination table 1303. The present system generates an initial solution of a schedule and generate an optimum solution while improving a specified evaluation item on the basis of the initial solution. The objective data table 102, the scheduled result table 103, the schedule process trace table 104, the strategy decision table 105, the evaluation table 106, the optimization method definition table 107, the consideration time table 108, the group 109 of allocation strategy algorithms, the solution generator 110, the evaluator 111 and the optimizer 112 are substantially the same in contents as the corresponding ones of the first embodiment.

Detailed Description Text (42):
The general controller 1301 judges whether or not a processing time taken from the start to the step 1406 of generating another solution exceeds the consideration time stored in the consideration limit time table 108 (step 1407). The determination of the processing time not exceeding the consideration limit time causes the general controller 1301 to return to the processing of the step 1403. The determination of the processing time exceeding the consideration limit time causes the general controller 1301 to activate the evaluator 111. The evaluator 111 selects the optimum case for the selected improvement evaluation item from the already generated solutions (step 1408), displays the optimum case and terminates its processing (step 1409).

Detailed Description Text (47):
As has been disclosed in the foregoing in accordance with the present invention, the determination of a scheduling strategy and the execution of the scheduling strategy are repetitively carried out according to a schedule situation in a solution generation step to generate an initial solution, an evaluation value of the above-generated latest solution is calculated to select an optimum solution for the calculated evaluation value of the evaluation item to be improved from already-generated solutions in an evaluation step, a branch for improving the evaluation value of the improvement evaluation item at high possibility is selected at a position as close to the initial state as possible to return the schedule situation to that state during generation of the optimum solution in an optimization step, one of scheduling strategies which has a high possibility of improving another evaluation value different from that at the time of finding the optimum solution of the already-generated solutions is executed, and thereafter the aforementioned solution generation step is executed to generate a new solution. Since such processing is repeated as long as possible within an allowable time to sequentially improve the evaluation value of each evaluation item and thereby to generate the optimum solution, there can be realized a computer-aided scheduling system which can improve a plurality of evaluation functions and can efficiently generate an optimum solution in various sorts of scheduling problems.

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L2: Entry 4 of 6 File: USPT Aug 31, 1993

US-PAT-NO: 5241465
DOCUMENT-IDENTIFIER: US 5241465 A

TITLE: Method for determining optimum schedule in computer-aided scheduling system

DATE-ISSUED: August 31, 1993

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
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Kawashima; Kazuhiro	Yokohama			JP
Hara; Keiichi	Kawasaki			JP

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APPL-NO: 07/ 690820 [PALM]
DATE FILED: April 23, 1991

FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	APPL-DATE
JP	2-113742	April 27, 1990

INT-CL: [05] G06F 15/22, G06F 15/20

US-CL-ISSUED: 364/401; 364/402, 364/408
US-CL-CURRENT: 705/8

FIELD-OF-SEARCH: 364/401, 364/402, 364/408, 395/904

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected | Search ALL

	PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
☐	5111391	May 1992	Fields et al.	364/401

OTHER PUBLICATIONS

Michael J. Shaw, "Knowledge-Based Scheduling in Flexible Manufacturing Systems: An Integration of Pattern-Directed Inference and Heuristic Search", International Journal of Production Research, vol. 26, No. 5, 1988, pp. 821-844 (Provided in English).

ART-UNIT: 231

PRIMARY-EXAMINER: Envall, Jr.; Roy N.

ASSISTANT-EXAMINER: Tran; Khai

ABSTRACT:

In a method for determining an optimum scheduling in a computer-aided scheduling system the data associated with a schedule to be generated is previously stored in a memory data. A strategy decision table showing therein one or more scheduling strategies suitable for a plurality of the states in a scheduling process is prepared. An optimization definition table indicating degree of improvement precedence or precedence order of the scheduling strategies of the evaluation items, where degree of improvement precedence is defined as degree of improvement of evaluation value of he evaluation item in changing of the scheduled strategy, is prepared. A schedule is generated by repetition of selecting and executing the scheduling strategies by using the strategy decision table. The other schedules are generated by changing the scheduling strategy selected in the state of the scheduling process by using the optimization definition table. An optimum schedule having the best evaluation value is selected.

10 Claims, 22 Drawing figures

L2: Entry 5 of 6 File: USPT Jan 5, 1993

DOCUMENT-IDENTIFIER: US 5177684 A
TITLE: Method for analyzing and generating optimal transportation schedules for vehicles such as trains and controlling the movement of vehicles in response thereto

US PATENT NO. (1):
5177684

Brief Summary Text (5):
The overall medium term operating policies to be implemented by the operating personnel (e.g., train dispatchers, yardmasters, trainmasters) are determined at the tactical planning level, which includes train service design (schedule planning), traffic routing and assignment to trains, and track maintenance policy. The term `tactical` is used herein in the sense defined by A. A. Assad, Modelling of Rail Networks. 14B Transportation Research, at 101-114 (1980) and T. Crainic, Rail Tactical Planning: Issues, Models and Tools, (Proceeding of the International Seminar on Freight Transportation Planning and Logistics, Bressanone, Italy, 1987) [hereinafter Crainic-Rail Tactical]. Design of train services or train scheduling at the tactical level consists of the determination of the train's itinerary (origin, destination, major intermediate points, and activity in each of those points), frequency (how many times per day, or per week, the service is offered), and timetable. A timetable provides arrival and departure times for each station (yard) in a train's itinerary.

Brief Summary Text (8):
In the real-time category, there are few operational models of optimal line operations (or train dispatching) to date. See R. L. Sauder & W. M. Westerman, Computer Aided Train Dispatching: Decision Support Through Optimization, 13 Interfaces, at 24-37 (1983); P. T. Harker, The Use of Satellite Tracking in Scheduling and Operating Railroads: Models, Algorithms and Applications. (Decision Sciences Department, The Wharton School of the University of Pennsylvania, Philadelphia, Pa., Working Paper 89-04-01, May, 1989). Even if many such real-time systems were available, the short-term scope of such a model would make it impractical for planning purposes. Another problem with the optimization models, both network and line-oriented, is that they are usually based on relatively rigid and simplified mathematical formulations of the problem; at present, it is a challenge just to understand and define all the details involved in the tactical train scheduling problem, let alone produce a detailed mathematical formulation of the problem.

Detailed Description Text (9):
Referring to FIG. 3, a data flow diagram for an optimal computer-aided dispatching (CAD) process is shown. The track database 18 and the train database 20 are combined with real time track and train information 10, respectively. The real time data 10 may include information on the status of each train on the line, the various management priorities which are used to determine which trains are the most important, and a model to compute the economic value of time associated with each train defined as the train's tardiness cost function. The CAD processor which is implemented on the CPU 4 then provides traffic forecasts 50, train value calculations 60 and a track update 40 to the dispatcher. The optimization system 70 comprises algorithms to provide the dispatcher with a substantially optimal solution in terms of cost for dispatching trains from various locations on the line and for assigning track maintenance time windows to sections of the track requiring maintenance. These functions are shown in FIG. 3 as train routing 80 and maintenance time windows 90.

Detailed Description Text (61):
An example of a delay that cannot be reduced by just one meet-shift is a delay of Inbound train 02 at meet with Outbound train 02 at meetpoint 3 in FIG. 12. Since Inbound train 02 was further delayed at the same meetpoint by Outbound train 03 after the delay it incurred at meet with Outbound train 02, shifting the meet of Outbound train 02 and Inbound train 01, which would in turn make Outbound train 02 arrive earlier at its meet with Inbound train 02 at meetpoint 3, is not enough to decrease the arrival time (and lateness) of Inbound train 02 at its destination at meetpoint 1. It is also necessary to reduce the latest delay that Inbound train 02 has incurred before arriving at its destination, which is the delay caused by the meet with Outbound train 03. Thus, the reduction of intermediate delays that a train has incurred is possible only in conjunction with the reduction of the train's last delay and cannot be achieved by shifting just one meet in the given plan.

CLAIMS:

9. In a transportation system having a plurality of vehicles, each vehicle having a scheduled departure time from an origin and a scheduled arrival time at a destination, there being a routing network defined by travel paths between the origin and destination, and delay points along each path for permitting one vehicle to wait until a second vehicle passes so as to avoid collision, a method comprising the steps of:

(a) inputting into a computer system at least one of the following data indicative of:

(i) a description of said routing network;

(ii) speed and mobility characteristics of each vehicle;

(iii) proposed transportation schedules for each vehicle specifying at least scheduled departure and arrival times;

(iv) a vehicle tardiness function for each vehicle indicative of an importance of each vehicle arriving at its destination on time;

(v) any changes in said routing network,

(vi) any changes in a physical characteristic of any path in said routing network; and,

(vii) vehicle status in said routing network;

(b) initializing at least one of:

(i) a first variable indicative of a maximum cost due to vehicle delays for said proposed transportation schedules input in step (a), said first variable defining an upper bound;

(ii) a second variable indicative of the minimum cost due to vehicle delays for said proposed transportation schedules input in step (a), said second variable defining a lower bound;

(c) grouping said vehicles into vehicle pairs having a first and second vehicle comprising substantially all possible combinations;

(d) determining, based upon the data input in (a), whether a potential conflict exists between said two vehicles of each vehicle pair, and if so, identifying said vehicle pair as a level,

(e) identifying substantially all delay points at a first level where at least one vehicle in said vehicle pair could be delayed so that the second vehicle in said pair could pass without collision therebetween, defining said delay points so identified as conflict resolution points,

(f) selecting one conflict resolution point identified in step (e) for said first level;

(g) determining an amount of time at least one vehicle in said vehicle pair must be

delayed at said selected conflict resolution point so that the second vehicle can pass by without collision therebetween, said amount of time said vehicle is delayed defining a delay time;

(h) updating said vehicles' scheduled departure and arrival times based upon said delay times determined in step (g);

(i) repeating steps (e) through (i) for each level identified in step (d);

(j) calculating a delay cost, based upon each delay time determined in step (g) and said respective vehicle tardiness functions input in step (a), for each vehicle delayed in step (g);

(k) calculating a cumulative delay cost by adding together said delay costs calculated in step (j), and defining said cumulative delay cost as a plan cost when said delay costs for substantially all levels have been added together;

(l) defining the arrival and departure times for each vehicle at each point along the vehicle's travel path between said origin and destination as a current plan if said plan cost is less than said upper bound, and setting said upper bound equal to said plan cost;

(m) selecting an alternative conflict resolution point from said conflict resolution points identified in step (e) but not selected in step (f);

(n) identifying substantially all vehicles whose delays determined in step (g) could be reduced by shifting said selected conflict resolution point to said alternative conflict resolution point selected in step (m), the vehicles so identified defining benefitted vehicles;

(o) estimating, based on said alternative conflict resolution point, an amount indicative of a potential net cost reduction by computing a difference in potential delay reductions at other levels and any delay increases, where said delay reductions and delay increases result from shifting to said alternate conflict resolution point in step (m), said difference computed defining a first maximum net benefit;

(p) repeating step (o), wherein the computation is based on said vehicles arriving at said alternate conflict resolution point on time with respect to their scheduled arrival times, said difference so computed defining a second maximum net benefit;

(q) estimating, based on said alternative conflict resolution point, any cost reduction to said plan cost by merging delays of vehicles which are delayed at different levels over at least partially the same time interval thereby determining each vehicle's actual delay time, said estimated cost reduction defining a merged cost decrease;

(r) redefining said lower bound by subtracting at least one of: (i) said second maximum net benefit; and (ii) said merged cost decrease

(s) defining said set of conflict resolution points selected in step (f) and (m), the vehicles delayed in step (g) and their respective delay times, and said cumulative delay cost as a fathomed path if any cumulative delay cost is greater than said upper bound, and redefining the cumulative delay cost of said path as said upper bound;

(t) identifying vehicle pairs at levels having both a positive second maximum net benefit and negative first maximum net benefit, and defining the vehicles of said vehicle pairs so identified as potential vehicles;

(u) repeating steps (h) through (l) based on said alternate conflict resolution point selected in step (m) when at least one of the following occurs:

(i) said level for which said alternate conflict resolution point has been selected has a positive first maximum net benefit; and

(ii) at least one benefitted vehicle is a potential vehicle for said level and second maximum net benefits at previous levels are negative;

(v) repeating step (u) until one of the following events

(i) no alternative conflict resolution points are available to be selected in one of steps (f) and (m);

(ii) said plan cost is less than a tolerance indicative of an acceptable difference between said upper bound and said lower bound, a plan having said plan cost defining a feasible plan; and

(iii) a predetermined time limit has expired and no feasible plans have been identified the step further comprising identifying said current plan as an optimal plan when one of said events has occurred; and

(w) controlling the movement of said vehicles so that the arrival and departure times for each vehicle at each point along the vehicle's respective travel path between said origin and said destination is controlled according to said optimal plan.

15. The method of claim 9, wherein step (p) further comprises the following steps:

(i) determining a reduced delay time compared to said delay time calculated in step (g) which would result if said vehicles delayed at said meet-shift resolution point incurred no previous delay;

(ii) identifying substantially all further cost reductions of said current plan arising from said reduced delay determined in step (i) of this claim 15;

(iii) summing substantially all the additional cost reductions of said current plan arising from delays at conflict resolution points which are both later in time than said meet-shift resolution point and physically located in the direction of movement of said delayed vehicle, said summed delay costs defining a general-meet-shift maximum cost decrease;

(iv) calculating, based on the reduced delay time determined in step (i) of this claim 12, said resulting delay cost and identifying that amount as said general-meet-shift minimum additional cost;

(v) subtracting said general-meet-shift minimum additional cost from the general-meet-shift maximum cost decrease resulting in a difference, said difference being said second maximum net benefit.

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L2: Entry 5 of 6 File: USPT Jan 5, 1993

US-PAT-NO: 5177684
DOCUMENT-IDENTIFIER: US 5177684 A

TITLE: Method for analyzing and generating optimal transportation schedules for vehicles such as trains and controlling the movement of vehicles in response thereto

DATE-ISSUED: January 5, 1993

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Harker; Patrick T.	Cherry Hill	NJ		
Jovanovic; Dejan	Fort Worth	TX		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
The Trustees of the University of Pennsylvania	Philadelphia	PA			02

APPL-NO: 07/ 629417 [PALM]
DATE FILED: December 18, 1990

INT-CL: [05] G06F 15/48, B61L 27/00

US-CL-ISSUED: 364/436; 364/424.02, 364/461, 246/5
US-CL-CURRENT: 701/117; 246/5, 701/301

FIELD-OF-SEARCH: 364/436, 364/424.01, 364/424.02, 364/426.05, 364/446, 364/468, 340/994, 246/2R, 246/3, 246/5

PRIOR-ART-DISCLOSED:

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Search Selected | Search ALL

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
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4791571	December 1988	Takahashi et al.	364/436
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ART-UNIT: 234

PRIMARY-EXAMINER: Black; Thomas G.

ASSISTANT-EXAMINER: Auchterlonie; Thomas S.

ABSTRACT:

A method of analyzing transportation schedules in a schedule analysis (SCAN) decision support system to determine the feasibility of the schedules is disclosed. In a transportation system, vehicles are delayed to avoid conflicts with other vehicles which would otherwise collide because the vehicles may be travelling along the same travel paths at different speeds or in opposite directions. The invention utilizes information relating to the vehicle travel paths, the vehicle's speed and mobility characteristics, a function based on the vehicle's on-time performance, proposed transportation schedules and real-time data associated with the travel paths and vehicles. This information is used to provide substantially optimal vehicle schedules with respect to cost resulting from vehicle delay.

16 Claims, 28 Drawing figures

L2: Entry 6 of 6 File: USPT Jun 16, 1992

DOCUMENT-IDENTIFIER: US 5122959 A
TITLE: Transportation dispatch and delivery tracking system

US PATENT NO. (1):
5122959

Detailed Description Text (134):
The system will also warn the dispatcher when an assignment causes any other job to be violated. The system then identifies that job in jeopardy. Thus, if a new stop is inserted into a prescheduled route causing the additional stop to make the estimated time of delivery late, the system will warn the dispatcher that there is not enough time for the previous job. The dispatcher may then override the time window for the previously assigned stop or cancel the new vehicle assignment.

Detailed Description Text (136):
The assignment program 310 operates in close conjunction with the minimum path subroutine 312. The minimum path program determines the minimum travel time by accessing a road network information base through the expanded memory manager (EMM) software. An expanded memory manager according to the Lotus-Intel-Microsoft standard 4.0 may be utilized.

Detailed Description Text (138):
The sequencing of links is by increasing "A" and then increasing "B" numbers. Travel times for each link are determined as a function of the link distance and the road category. The travel times are loaded along with the node number arrays into "expanded memory" at run-time. The times for each link are then automatically adjusted during different hours of the day. As such, traffic conditions can be factored into time determinations. The system also has the capability of allowing for graphics input to specify changes in road links based upon unpredicted or unusual traffic conditions, such as accidents, road repairs, police blocks, etc.

Detailed Description Text (143):
Step 4. Retain the branch travel time in a separate array. If the branch travel time is less than the existing total travel time determined by step 1, replace the existing total time with the new branch time. In another internal array, the "A" node value is stored which was used to reach the branch time in step 3.

Detailed Description Text (158):
The real-time clock procedure operations are as follows: Pre-scheduled jobs are entered into a permanent file with specific days of the week. The system then automatically loads the appropriate jobs each day into a daily transaction queue. As a result, the pre-scheduled jobs can be added, deleted or modified up to a year in advance. The pre-scheduled transactions are created at the order entry stage (FIG. 2) and include time windows which will not be displayed on an undispatched job screen until a specific delay before a deadline (usually a half hour). Thus, the real time clock subroutine 326 is polled at this level in order to determine whether any of the pre-schedules should become active on the text display. Once a half hour increment is reached, for example, the real time clock 326 causes a pre-scheduled reminder to be activated which is then provided to the text control routine 304.

Detailed Description Text (159):
All transactions that are entered by the order entry program in FIG. 2 as emergencies are automatically assigned deadlines. Emergency indicators are raised within a specified time period from the time that the call is stamped by the order

entry program. Failing a pickup confirmation, for example, within such a specified deadline (as determined from polling to the real-time clock 326) will change the video attribute to a blinking message.

CLAIMS:

26. The integrated vehicle dispatch system according to claim 25, whereby travel times for each link are determined as a function of said link distance and a road category.

27. The integrated vehicle dispatch system according to claim 26, wherein times for each link are automatically adjusted during different hours of a day such that traffic conditions, accidents, road repairs and other circumstances can be factored into time determinations.

28. The integrated vehicle dispatch system according to claim 27, wherein the said minimum path is calculated by iterating all nodes connected to a starting point, calculating a total time for each branch of said node and determining a total time of travel between a beginning node and an ending node for each vehicle, such that a minimum travel time per vehicle is determined.

WEST

End of Result Set

Generate Collection | Print

L2: Entry 6 of 6 File: USPT Jun 16, 1992

US-PAT-NO: 5122959
DOCUMENT-IDENTIFIER: US 5122959 A

TITLE: Transportation dispatch and delivery tracking system

DATE-ISSUED: June 16, 1992

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Nathanson; Martin	Montreal			CA
Brown; David	Montreal			CA

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Automated Dispatch Services, Inc.	Miami	FL			02

APPL-NO: 07/ 264048 [PALM]
DATE FILED: October 28, 1988

INT-CL: [05] G06F 15/48

US-CL-ISSUED: 364/436; 340/993
US-CL-CURRENT: 701/117; 340/993

FIELD-OF-SEARCH: 364/436, 364/467, 340/993, 340/994, 340/995

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected | Search ALL

	PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
☐	4015804	April 1977	Dobler et al.	364/436
☐	4092718	May 1978	Wendt	364/436
☐	4212069	July 1980	Baumann	364/467
☐	4360875	November 1982	Behnke	364/436
☐	4613913	September 1986	Phillips	360/51
☐	4646015	February 1987	Phillips	324/253
☐	4686642	August 1987	Buxton et al.	364/607
☐	4701760	October 1987	Raoux	340/993
☐	4713661	December 1987	Boone et al.	340/994
☐	4734863	March 1988	Honey et al.	364/449
☐	4791571	December 1988	Takahashi et al.	364/436
☐	4799162	January 1989	Shinkawa et al.	364/436

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Megadyne Information Systems brochure "V-Trax Product Description" Sep. 1988, 8 pgs.

Megadyne Information Systems Product Brief--undated, 7 pgs.
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Motorola Automatic Vehicle Location System brochure--1985, 6 pgs.
Morrow, Inc. Vehicle Tracking System brochure--1987, 6 pgs.
Gandolf Systems Group Cabmate brochure--undated, 4 pages; Cabmate brochure, 4 pgs.
Mobile Data Int'l--Databurst Newsletter--Spring 1987, 5 pgs.
Mobile Data Int'l--Databurst Newsletter--Wiinter 1985, 3 pgs.
Mets, Inc. Automatic Vehicle Location brochure--undated, 6 pgs.

ART-UNIT: 234

PRIMARY-EXAMINER: Black; Thomas G.

ABSTRACT:

An integrated vehicle dispatch system that performs the management, coordination and communication functions for dispatching vehicles. The system include a plurality of microcomputers interconnected via a "BITBUS" network, such that a fully redundant capability is provided. Each of the workstations control text and or graphics monitors. Information in the graphics monitors are based upon a digitized map base, such as the U.S. Census Bureau GBF file or "DIME File" of the vehicle delivery areas, such that vehicle pickup, deliveries, minimum path routes and vehicles delivery zones are displayed in an icon-based format. The software of the system calculates minimum travel time based upon a tree-node decision algorithm that matches street distances, and travel times to real traffic conditions. Candidate vehicles for pickups and deliveries are selected upon a user-defined set of factors that include time, speed, vehicle characteristics and distance factors. The software also includes a fully integrated third party billing and business operations accounting package that enables fully automated dispatch system operation.

42 Claims, 7 Drawing figures

WEST

End of Result Set

Generate Collection | Print

L27: Entry 2 of 2 File: USPT Mar 23, 1993

US-PAT-NO: 5197004
DOCUMENT-IDENTIFIER: US 5197004 A

TITLE: Method and apparatus for automatic categorization of applicants from resumes

DATE-ISSUED: March 23, 1993

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Sobotka; David	Sunnyvale	CA		
Leung; Ka L.	San Jose	CA		
Inn; Yul J.	Mountain View	CA		
Tokuda; Lance	Milpitas	CA		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Resumix, Inc.	Santa Clara	CA			02

APPL-NO: 07/ 349028 [PALM]
DATE FILED: May 8, 1989

INT-CL: [05] G06F 15/38, G06G 7/60

US-CL-ISSUED: 364/419
US-CL-CURRENT: 705/8; 706/52, 706/53, 706/925

FIELD-OF-SEARCH: 364/419, 382/61

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected | Search ALL

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
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4706212	November 1987	Toma	364/900
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8/919450

WEST

Generate Collection | Print

L25: Entry 1 of 3 File: USPT Aug 24, 1999

US-PAT-NO: 5943652
DOCUMENT-IDENTIFIER: US 5943652 A

TITLE: Resource assignment and scheduling system

DATE-ISSUED: August 24, 1999

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Sisley; Elizabeth M.	Woodbury	MN		
Collins; John E.	Hudson	WI		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
3M Innovative Properties Company	St. Paul	MN			02

APPL-NO: 08/ 844087 [PALM]
DATE FILED: April 18, 1997

PARENT-CASE:
This is a continuation of application Ser. No. 08/440,770, filed May 15, 1995, now U.S. Pat. No. 5,737,728, which is a continuation of application Ser. No. 08/201,664, filed Feb. 25, 1994, now U.S. Pat. No. 5,467,268, from which filing date priority is claimed under 35 U.S.C. 120.

INT-CL: [06] G06 F 19/00

US-CL-ISSUED: 705/9; 705/8
US-CL-CURRENT: 705/9; 705/8

FIELD-OF-SEARCH: 364/468.05, 364/468.06, 395/670, 395/672, 395/674, 705/8, 705/9

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected | Search ALL

	PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
☐	4092718	May 1978	Wendt	364/436
☐	4212069	July 1980	Baumann	364/467
☐	4799162	January 1989	Shinkawa et al.	364/436
☐	4937743	June 1990	Rassman et al.	364/401
☐	5099431	March 1992	Natarajan	364/468
☐	5122929	June 1992	Nathanson et al.	364/436
☐	5177684	January 1993	Harker et al.	364/436
☐	5241465	August 1993	Oba et al.	364/401
☐	5255181	October 1993	Chapman et al.	364/401
☐	5295065	March 1994	Chapman et al.	364/401
☐	5325292	June 1994	Crockett	364/401

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	US-CL
0 400 789	May 1990	EP	

OTHER PUBLICATIONS

H. Berliner and G. Goetsch, "A Study of Search Methods: The Effect of Constraint Satisfaction and Adventurousness," in Proceedings of the Ninth International Joint Conference on Artifical Intelligence, vol. 2, Aug. 18-23, 1985, pp. 11079-11082.

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T. Dean and M. Boddy, "An Analysis of Time-Dependent Planning," in Proceedings of the Seventh National Conference on Artificial Intelligence, A.A.A.I., 1988, pp. 49-54.

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M.S. Fox and S.F. Smith, "ISIS--A Knowledge-Based System for Factory Scheduling," Expert Systems, vol. 1, No. 1, 1984, pp. 25-49.

E. Ghalichi and J. Collins, "The Dispatch Advisor," in Proceedings of the Workshop on Artificial Intelligence for Customer Service and Support, Eighth IEEE Conference on Artificial Intelligence Applications, Monterey, California, Mar. 3, 1992, pp. 60-68.

D.L. Haugen, "A Study of Scheduling and Quality of Field-Service Support Systems," Ph.D. Thesis, University of Minnesota, Nov. 1993, pp. 1-251.

A.V. Hill, "An Experimental Comparison of Dispatching Rules for Field Service Support," Decision Sciences, vol. 23, No. 1, Winter 1992, pp. 235-249.

A.V. Hill, "An Experimental Comparison of Human Schedulers and Heuristic Algorithms for the Traveling Salesman Problem," Journal of Operations Management, vol. 2, No. 4, Aug. 1982, pp. 215-233.

A.V. Hill, V.A. Mabert, and D.W. Montgomery, "A Decision Support System for the Courier Vehicle Scheduling Problem," OMEGA Int. J. of Mgmt. Sci., vol. 16, No. 4, 1988, pp. 333-345.

A.V. Hill, J.D. Naumann, and N.L. Chervany, "SCAT and SPAT: Large-Scale Computer-Based Optimization Systems for the Personnel Assignment Problem," Decision Sciences, vol. 14, No. 2, Apr. 1983, pp. 207-220.

A.V. Hill and D.C. Whybark, "Comparing Exact Solution Procedures for the Multi-Vehicle Routing Problem," The Logistics and Transportation Review, vol. 12, No. 3, 1976, pp. 145-153.

A.V. Hill and D.C. Whybark, "Chexpedite: A Computer-Based Approach to the Bank Courier Problem," Decision Sciences, vol. 13, No. 2, Apr. 1982, pp. 251-265.

R. Hublou, "Manufacturing Operations Scheduling," Business Intelligence Program Report D90-1436, SRI International, May 1990, pp. 1-39.
B. Kalantari, A.V. Hill, and S.R. Arora, "An Algorithm for the Traveling Salesman Problem with Pickup and Delivery Customers", European Journal of Operational Research, vol. 22, No. 3, Dec. 1985, pp. 377-386.
H. Prade, "Using Fuzzy Set Theory in a Scheduling Problem: A Case Study," Fuzzy Sets and Systems, vol. 2, No. 2, 1979, pp. 153-165.
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Collins et al., "Automated Assignment and Scheduling of Service Personnel", IEEE Expert, vol. 9, No. 2, Apr. 1994, pp. 33-39.
Sycara et al., "Distributed Constrained Heuristic Search", IEEE Transactions on Systems, Man and Cybernetics, vol. 21, No. 6, Nov. 1991, pp. 1446-1461.
P. Prosser, "A Reactive Scheduling Agent," in Proceedings of the Eleventh International Joint Conference on Artificial Intelligence, Detroit, Michigan, Aug. 20-25, 1989, pp. 1004-1009.
S.F. Smith, "The OPIS Framework for Modeling Manufacturing Systems," Tech Report CMU-RI-TR-89-30, Carnegie-Mellon University, Dec. 1989, pp. 1-56.
J. Tsitsiklis, "Special Cases of Traveling Salesman and Repairman Problems with Time Windows," Report LIDS-P-1987, Massachusetts Institute of Technology, Jun. 1990, pp. 1-23.
W. Chiang, and M.S. Fox, "Protection Against Uncertainty in a Deterministic Schedule," in Proceedings of the Fourth International Conference on Expert Systems in Production and Operations Management, Hilton Head, South Carolina, May 1990, pp. 184-196.
D. Whitley, T. Starkweather, and D. Shaner, "The Traveling Salesman and Sequence Scheduling: Quality Solutions Using Genetic Edge Recombination," Handbook of Genetic Algorithms, Chapter 22, 1991, pp. 350-372.
M. Zweben, "Constraint-Based Simulated Annealing: An Iterative Improvement Framework for Constraint Satisfaction Search," NASA Ames Research Center, Moffett Field, California, Aug. 9, 1990, pp. 1-13.
M. Zweben, M. Deale, and R. Gargan, "Anytime Rescheduling," in Proceedings of a Workshop on Innovative Approaches to Planning, Scheduling and Control, San Diego, California, Nov. 5-8, 1990, pp. 251-259.

ART-UNIT: 271

PRIMARY-EXAMINER: Poinvil; Frantzy

ATTY-AGENT-FIRM: Shumaker; Steven J. Bauer; William D.

ABSTRACT:

A system and method for assigning and scheduling resource requests to resource providers use a modified "best-first" search technique that combines optimization, artificial intelligence, and constraint-processing to arrive at near-optimal assignment and scheduling solutions. In response to changes in a dynamic resource environment, potential changes to an existing assignment set are evaluated in a search for a better solution. New calls are assigned and scheduled as they are received, and the assignment set is readjusted as the field service environment changes, resulting in global optimization. Each search operation is in response to either an incremental change to the assignment set such as adding a new resource request, removing a pending resource request, reassigning a pending resource request, or to a request for further evaluation. Thus, the search technique assumes that the existing assignment set is already optimized, and limits the task only to evaluating the effects of the incremental change. In addition, each search operation produces a complete assignment and scheduling solution. Consequently, the search can be terminated to accept the best solution generated so far, making the technique an "anytime" search.

37 Claims, 10 Drawing figures

L25: Entry 1 of 3 File: USPT Aug 24, 1999

DOCUMENT-IDENTIFIER: US 5943652 A
TITLE: Resource assignment and scheduling system

Application Filing Date (1):
19970418

Current US Original Classification (1):
705/9

Current US Cross Reference Classification (1):
705/8

CLAIMS:

3. The computer-implemented system of claim 1, wherein the plurality of resource requests includes an unassigned new resource request, and the step (a) includes the steps of:

(a)(i) expanding the root node by forming one or more first-level nodes, each of the first-level nodes corresponding to the root node but being further defined by an assignment of the new resource request to a selected one of the resource providers;

(a)(ii) estimating, for each of the first-level nodes, a stress value representing a degree of undesirability of the respective assignment; and

(a)(iii) expanding one or more of the first-level nodes by forming, for each of the first-level nodes, one or more of the next-level nodes, wherein each of the next-level nodes corresponds to the respective first-level node but is further defined by a reassignment of one of the pending resource requests between the selected one of the resource providers and another of the resource providers,

wherein the new assignment set corresponds to one of the first-level nodes and the next-level nodes having a minimum stress value.

WEST

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L25: Entry 2 of 3 File: USPT Apr 7, 1998

US-PAT-NO: 5737728
DOCUMENT-IDENTIFIER: US 5737728 A

TITLE: System for resource assignment and scheduling

DATE-ISSUED: April 7, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Sisley; Elizabeth M.	Woodbury	MN		
Collins; John E.	Hudson	WI		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Minnesota Mining and Manufacturing Company	Saint Paul	MN			02

APPL-NO: 08/ 440770 [PALM]
DATE FILED: May 15, 1995

PARENT-CASE:
This is a continuation of application Ser. No. 08/201,664 filed Feb. 25, 1994, 5,467,268.

INT-CL: [06] G06 F 17/60

US-CL-ISSUED: 705/8; 705/9, 364/468.05, 364/468.06
US-CL-CURRENT: 705/8; 700/100, 700/99, 705/9

FIELD-OF-SEARCH: 364/41R, 364/402, 364/403, 364/468.05, 364/468.06, 395/902, 395/903, 395/906, 395/208, 395/209, 705/8

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected | Search ALL

	PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
☐	4092718	May 1978	Wendt	364/436
☐	4212069	July 1980	Baumann	364/467
☐	4799162	January 1989	Shinkawa et al.	364/436
☐	4937743	June 1990	Rassman et al.	364/401
☐	5099431	March 1992	Natarajan	364/468
☐	5122959	June 1992	Nathanson et al.	364/436
☐	5177684	January 1993	Harker et al.	364/436
☐	5241465	August 1993	Oba et al.	364/401
☐	5255181	October 1993	Chapman et al.	364/401
☐	5295065	March 1994	Chapman et al.	364/401
☐	5325292	June 1994	Crockett	364/401

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	US-CL
0 400 789	May 1990	EP	

OTHER PUBLICATIONS

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Collins et al., "Automated Assignment and Scheduling of Service Personnel", IEEE Expert, vol. 9, No. 2, Apr. 1994, pp. 33-39.
Sycara et al., "Distributed Constrained Heuristic Search", IEEE Transactions on Systems, Man and Cybernetics, vol. 21, No. 6, Nov. 1991, pp. 1446-1461.
H. Berliner and G. Goetsch, "A Study of Search Methods: The Effect of Constraint Satisfaction and Adventurousness," in Proceedings of the Ninth International Joint Conference on Artificial Intelligence, vol. 2, Aug. 18-23, 1985, pp. 11079-11082.
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T. Dean and M. Boddy, "An Analysis of Time-Dependent Planning," in Proceedings of the Seventh National Conference on Artificial Intelligence, A.A.A.I., 1988, pp. 49-54.
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M.S. Fox and S.F. Smith, "ISIS--A Knowledge-Based System for Factory Scheduling," Expert Systems, vol. 1, No. 1, 1984, pp. 25-49.
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A.V. Hill, V.A. Mabert, and D.W. Montgomery, "A Decision Support System for the Courier Vehicle Scheduling Problem," OMEGA Int. J. of Mgmt. Sci., vol. 16, No. 4, 1988, pp. 333-345.
A.V. Hill, J.D. Naumann, and N.L. Chervany, "SCAT and SPAT: Large-Scale Computer-Based Optimization Systems for the Personnel Assignment Problem," Decision

Sciences, vol. 14, No. 2, Apr. 1983, pp. 207-220.
A.V. Hill and D.C. Whybark, "Comparing Exact Solution Procedures for the Multi-Vehicle Routing Problem," The Logistics and Transportation Review, vol. 12, No. 3, 1976, pp. 145-153.
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R. Hublou, "Manufacturing Operations Scheduling," Business Intelligence Program Report D90-1436, SRI International, May 1990, pp. 1-39.
B. Kalantari, A.V. Hill, and S.R. Arora, "An Algorithm for the Traveling Salesman Problem with Pickup and Delivery Customers", European Journal of Operational Research, vol. 22, No. 3, Dec. 1985, pp. 377-386.
H. Prade, "Using Fuzzy Set Theory in a Scheduling Problem: A Case Study," Fuzzy Sets and Systems, vol. 2, No. 2, 1979, pp. 153-165.
P. Prosser, "A Reactive Scheduling Agent," in Proceedings of the Eleventh International Joint Conference on Artificial Intelligence, Detroit, Michigan, Aug. 20-25, 1989, pp. 1004-1009.
S.F. Smith, "The OPIS Framework for Modeling Manufacturing Systems," Tech Report CMU-RI-TR-89-30, Carnegie-Mellon University, Dec. 1989, pp. 1-56.
J. Tsitsiklis, "Special Cases of Traveling Salesman and Repairman Problems with Time Windows," Report LIDS-P-1987, Massachusetts Institute of Technology, Jun. 1990, pp. 1-23.
W. Chiang, and M.S. Fox, "Protection Against Uncertainty in a Deterministic Schedule," in Proceedings of the Fourth International Conference on Expert Systems in Production and Operations Management, Hilton Head, South Carolina, May 1990, pp. 184-196.
D. Whitley, T. Starkweather, and D. Shaner, "The Traveling Salesman and Sequence Scheduling: Quality Solutions Using Genetic Edge Recombination," Handbook of Genetic Algorithms Chapter 22, 1991, pp. 350-372.
M. Zweben, "Constraint-Based Simulated Annealing: An Iterative Improvement Framework for Constraint Satisfaction Search," NASA Ames Research Center, Moffett Field, California, Aug. 9, 1990, pp. 1-13.
M. Zweben, M. Deale, and R. Gargan, "Anytime Rescheduling," in Proceedings of a Workshop on Innovative Approaches to Planning, Scheduling and Control, San Diego, California, Nov. 5-8, 1990, pp. 251-259.

ART-UNIT: 241

PRIMARY-EXAMINER: Hayes; Gail O.

ASSISTANT-EXAMINER: Hughet; William N.

ATTY-AGENT-FIRM: Bauer; William D.

ABSTRACT:

A system and method for assigning and scheduling resource requests to resource providers use a modified "best-first" search technique that combines optimization, artificial intelligence, and constraint-processing to arrive at near-optimal assignment and scheduling solutions. In response to changes in a dynamic resource environment, potential changes to an existing assignment set are evaluated in a search for a better solution. New calls are assigned and scheduled as they are received, and the assignment set is readjusted as the field service environment changes, resulting in global optimization. Each search operation is in response to either an incremental change to the assignment set such as adding a new resource request, removing a pending resource request, reassigning a pending resource request, or to a request for further evaluation. Thus, the search technique assumes that the existing assignment set is already optimized, and limits the task only to evaluating the effects of the incremental change. In addition, each search operation produces a complete assignment and scheduling solution. Consequently, the search can be terminated to accept the best solution generated so far, making the technique an "anytime" search.

52 Claims, 10 Drawing figures

Generate Collection Print

L25: Entry 2 of 3 File: USPT Apr 7, 1998

DOCUMENT-IDENTIFIER: US 5737728 A
TITLE: System for resource assignment and scheduling

Application Filing Date (1):
19950515

Current US Original Classification (1):
705/8

Current US Cross Reference Classification (3):
705/9

CLAIMS:

3. The system of claim 1, wherein said plurality of resource requests includes an unassigned new resource request, and said means (a) for expanding said root node includes:

(a)(i) means for expanding said root node by forming one or more first-level nodes, each of said first-level nodes corresponding to said root node but being further defined by an assignment of said new resource request to a selected one of said resource providers;

(a)(ii) means for estimating, for each of said first-level nodes, a stress value representing a degree of undesirability of the respective assignment; and

(a)(iii) means for expanding one or more of said first-level nodes by forming, for each of said first-level nodes, one or more of said next-level nodes, wherein each of said next-level nodes corresponds to the respective first-level node but is further defined by a reassignment of one of said pending resource requests between said selected one of said resource providers and another of said resource providers,

wherein said new assignment set corresponds to one of said first-level nodes and said next-level nodes having a minimum stress value.

End of Result Set

Generate Collection | Print

L25: Entry 3 of 3 File: USPT Nov 14, 1995

US-PAT-NO: 5467268
DOCUMENT-IDENTIFIER: US 5467268 A
**** See image for Certificate of Correction ****

TITLE: Method for resource assignment and scheduling

DATE-ISSUED: November 14, 1995

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Sisley; Elizabeth M.	Woodbury	MN		
Collins; John E.	Hudson	WI		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Minnesota Mining and Manufacturing Company	St. Paul	MN			02

APPL-NO: 08/ 201664 [PALM]
DATE FILED: February 25, 1994

INT-CL: [06] G06 F 19/00

US-CL-ISSUED: 364/401
US-CL-CURRENT: 705/9

FIELD-OF-SEARCH: 364/403, 364/402, 364/401, 364/424.02, 364/436, 395/913, 395/925, 395/926

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected | Search ALL

	PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
☐	4092718	May 1978	Wendt	
☐	4212069	July 1980	Baumann	
☐	4799162	January 1989	Shinkawa et al.	
☐	4937743	June 1990	Rassman et al.	364/401
☐	5099431	March 1992	Natarajan	364/468
☐	5122959	June 1992	Nathanson et al.	
☐	5177684	January 1993	Harker et al.	364/436
☐	5241465	August 1993	Oba et al.	364/401
☐	5255181	October 1993	Chapman et al.	364/401
☐	5295065	March 1994	Chapman et al.	364/401
☐	5325292	June 1994	Crockett	364/401

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A. V. Hill and D. C. Whybark, "Chexpedite: A Computer-Based Approach to the Bank Courier Problem," Decision Sciences, vol. 13, No. 2, Apr. 1982, pp. 251-265.
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A. V. Hill and D. C. Whybark, "Comparing Exact Solution Procedures for the Multi-Vehicle Routing Problem," The Logistics and Transportation Review, vol. 12, No. 3, 1976, pp. 145-153.
T. Dean and M. Boddy, "An Analysis of Time-Dependent Planning," in Proceedings of the Seventh National Conference on Artificial Intelligence, A.A.A.I., 1988, pp. 49-54.
H. Berliner and G. Goetsch, "A Study of Search Methods: The Effect of Constraint Satisfaction and Adventurousness," in Proceedings of the Ninth International Joint Conference on Artificial Intelligence, vol. 2, Aug. 18-23, 1985, pp. 1079-1082.
A. V. Hill, J. D. Naumann, and N. L. Chervany, "SCAT and SPAT: Large-Scale Computer-Based Optimization Systems for the Personnel Assignment Problem", Decision Sciences, vol. 14, No. 2, Apr. 1983, pp. 207-220.
B. Kalantari, A. V. Hill, and S. R. Arora, "An algorithm for the traveling salesman problem with pickup and delivery customers," European Journal of Operational Research, vol. 22, No. 3, Dec. 1985, pp. 377-386.
A. V. Hill, "An Experimental Comparison of Dispatching Rules for Field Service Support," Decision Sciences, vol. 23, No. 1, Winter 1992, pp. 235-249.
D. Whitley, T. Starkweather, and D. Shaner, "The Traveling Salesman and Sequence Scheduling: Quality Solutions Using Genetic Edge Recombination," Handbook of Genetic Algorithms, Chapter 22, 1991, pp. 350-372.
M. Zweben, M. Deale, and R. Gargan, "Anytime Rescheduling," in Proceedings of a Workshop on Innovative Approaches to Planning, Scheduling and Control, San Diego, California, Nov. 5-8, 1990, pp. 251-259.
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H. Prade, "Using Fuzzy Set Theory in a Scheduling Problem: A Case Study," Fuzzy Sets and Systems, vol. 2, No. 2, 1979, pp. 153-165.
M. S. Fox, N. Sadeh and C. Baykan, "Constrained Heuristic Search," in Proceedings of the Eleventh International Joint Conference on Artificial Intelligence (IJCAI), Detroit, Michigan, vol. 1, Aug. 20-25, 1989, pp. 309-315.
W. Chiang and M. S. Fox, "Protection Against Uncertainty in a Deterministic Schedule," in Proceedings of the Fourth International Conference on Expert Systems in Production and Operations Management, Hilton Head, South Carolina, May 1990, pp. 184-196.
M. Zweben, "Constraint-Based Simulated Annealing: An Iterative Improvement Framework for Constraint Satisfaction Search," NASA Ames Research Center, Moffett Field, California, Aug. 9, 1990, pp. 1-13.
R. Hublou, "Manufacturing Operations Scheduling," Business Intelligence Program Report D90-1436, SRI International, May 1990, pp. 1-39.
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for the Traveling Salesman Problem," Journal of Operations Management, vol. 2, No. 4, Aug. 1982, pp. 215-223.
P. Prosser, "A Reactive Scheduling Agent," in Proceedings of the Eleventh International Joint Conference on Artificial Intelligence, Detroit, Michigan, Aug. 20-25, 1989, pp. 1004-1009.
E. Ghalichi and J. Collins, "The Dispatch Advisor," in Proceedings of the Workshop on Artificial Intelligence for Customer Service and Support, Eighth IEEE Conference on Artificial Intelligence Applications, Monterey, California, Mar. 3, 1992, pp. 60-68.
J. E. Collins and E. M. Sisley, "AI in Field Service: The Dispatch Advisor," in Working Notes, AI in Service and Support: Bridging the Gap Between Research and Applications, Eleventh National Conference on Artificial Intelligence, Washington, D.C., Jul. 11-15, 1993, pp. 26-37.
J. Tsitsiklis, "Special Cases of Traveling Salesman and Repairman Problems with Time Windows," Report LIDS-P-1987, Massachusetts Institute of Technology, Jun. 1990, pp. 1-23.
S. F. Smith, "The OPIS Framework for Modeling Manufacturing Systems," Tech Report CMU-RI-TR-89-30, Carnegie-Mellon University, Dec. 1989, pp. 1-56.
D. L. Haugen, "A Study of Scheduling and Quality of Field-Service Support Systems," Ph.D. Thesis, University of Minnesota, Nov. 1993, pp. 1-251.

ART-UNIT: 241

PRIMARY-EXAMINER: McElheny, Jr.; Donald E.

ATTY-AGENT-FIRM: Griswold; Gary L. Kirn; Walter N. Shumaker; Steven J.

ABSTRACT:

A system and method for assigning and scheduling resource requests to resource providers use a modified "best-first" search technique that combines optimization, artificial intelligence, and constraint-processing to arrive at near-optimal assignment and scheduling solutions. In response to changes in a dynamic resource environment, potential changes to an existing assignment set are evaluated in a search for a better solution. New calls are assigned and scheduled as they are received, and the assignment set is readjusted as the field service environment changes, resulting in global optimization. Each search operation is in response to either an incremental change to the assignment set such as adding a new resource request, removing a pending resource request, reassigning a pending resource request, or to a request for further evaluation. Thus, the search technique assumes that the existing assignment set is already optimized, and limits the task only to evaluating the effects of the incremental change. In addition, each search operation produces a complete assignment and scheduling solution. Consequently, the search can be terminated to accept the best solution generated so far, making the technique an "anytime" search.

52 Claims, 10 Drawing figures

End of Result Set

Generate Collection | Print

L25: Entry 3 of 3 File: USPT Nov 14, 1995

DOCUMENT-IDENTIFIER: US 5467268 A
**** See image for Certificate of Correction ****
TITLE: Method for resource assignment and scheduling

Application Filing Date (1):
19940225

Current US Original Classification (1):
705/9

CLAIMS:

3. The method of claim 1, wherein said plurality of resource requests includes an unassigned new resource request, and said step (a) includes the steps of:

(a)(i) expanding said root node by forming one or more first-level nodes, each of said first-level nodes corresponding to said root node but being further defined by an assignment of said new resource request to a selected one of said resource providers;

(a)(ii) estimating, for each of said first-level nodes, a stress value representing a degree of undesirability of the respective assignment; and

(a)(iii) expanding one or more of said first-level nodes by forming, for each of said first-level nodes, one or more of said next-level nodes, wherein each of said next-level nodes corresponds to the respective first-level node but is further defined by a reassignment of one of said pending resource requests between said selected one of said resource providers and another of said resource providers,

wherein said new assignment set corresponds to one of said first-level nodes and said next-level nodes having a minimum stress value.

L25: Entry 1 of 3 File: USPT Aug 24, 1999

DOCUMENT-IDENTIFIER: US 5943652 A
TITLE: Resource assignment and scheduling system

Application Filing Date (1):
19970418

Current US Original Classification (1):
705/9

Current US Cross Reference Classification (1):
705/8

CLAIMS:

3. The computer-implemented system of claim 1, wherein the plurality of resource requests includes an unassigned new resource request, and the step (a) includes the steps of:

(a)(i) expanding the root node by forming one or more first-level nodes, each of the first-level nodes corresponding to the root node but being further defined by an assignment of the new resource request to a selected one of the resource providers;

(a)(ii) estimating, for each of the first-level nodes, a stress value representing a degree of undesirability of the respective assignment; and

(a)(iii) expanding one or more of the first-level nodes by forming, for each of the first-level nodes, one or more of the next-level nodes, wherein each of the next-level nodes corresponds to the respective first-level node but is further defined by a reassignment of one of the pending resource requests between the selected one of the resource providers and another of the resource providers,

wherein the new assignment set corresponds to one of the first-level nodes and the next-level nodes having a minimum stress value.

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L25: Entry 1 of 3 File: USPT Aug 24, 1999

US-PAT-NO: 5943652
DOCUMENT-IDENTIFIER: US 5943652 A

TITLE: Resource assignment and scheduling system

DATE-ISSUED: August 24, 1999

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Sisley; Elizabeth M.	Woodbury	MN		
Collins; John E.	Hudson	WI		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
3M Innovative Properties Company	St. Paul	MN			02

APPL-NO: 08/ 844087 [PALM]
DATE FILED: April 18, 1997

PARENT-CASE:
This is a continuation of application Ser. No. 08/440,770, filed May 15, 1995, now U.S. Pat. No. 5,737,728, which is a continuation of application Ser. No. 08/201,664, filed Feb. 25, 1994, now U.S. Pat. No. 5,467,268, from which filing date priority is claimed under 35 U.S.C. 120.

INT-CL: [06] G06 F 19/00

US-CL-ISSUED: 705/9; 705/8
US-CL-CURRENT: 705/9; 705/8

FIELD-OF-SEARCH: 364/468.05, 364/468.06, 395/670, 395/672, 395/674, 705/8, 705/9

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected | Search ALL

	PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
☐	4092718	May 1978	Wendt	364/436
☐	4212069	July 1980	Baumann	364/467
☐	4799162	January 1989	Shinkawa et al.	364/436
☐	4937743	June 1990	Rassman et al.	364/401
☐	5099431	March 1992	Natarajan	364/468
☐	5122929	June 1992	Nathanson et al.	364/436
☐	5177684	January 1993	Harker et al.	364/436
☐	5241465	August 1993	Oba et al.	364/401
☐	5255181	October 1993	Chapman et al.	364/401
☐	5295065	March 1994	Chapman et al.	364/401
☐	5325292	June 1994	Crockett	364/401

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FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	US-CL
0 400 789	May 1990	EP	

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M.S. Fox, N. Sadeh, and C. Baykan, "Constrained Heuristic Search," in Proceedings of the Eleventh International Joint Conference on Artificial Intelligence (IJCAI), Detroit, Michigan, vol. 1, Aug. 20-25, 1989, pp. 309-315.

M.S. Fox and S.F. Smith, "ISIS--A Knowledge-Based System for Factory Scheduling," Expert Systems, vol. 1, No. 1, 1984, pp. 25-49.

E. Ghalichi and J. Collins, "The Dispatch Advisor," in Proceedings of the Workshop on Artificial Intelligence for Customer Service and Support, Eighth IEEE Conference on Artificial Intelligence Applications, Monterey, California, Mar. 3, 1992, pp. 60-68.

D.L. Haugen, "A Study of Scheduling and Quality of Field-Service Support Systems," Ph.D. Thesis, University of Minnesota, Nov. 1993, pp. 1-251.

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A.V. Hill and D.C. Whybark, "Comparing Exact Solution Procedures for the Multi-Vehicle Routing Problem," The Logistics and Transportation Review, vol. 12, No. 3, 1976, pp. 145-153.

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R. Hublou, "Manufacturing Operations Scheduling," Business Intelligence Program Report D90-1436, SRI International, May 1990, pp. 1-39.
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P. Prosser, "A Reactive Scheduling Agent," in Proceedings of the Eleventh International Joint Conference on Artificial Intelligence, Detroit, Michigan, Aug. 20-25, 1989, pp. 1004-1009.
S.F. Smith, "The OPIS Framework for Modeling Manufacturing Systems," Tech Report CMU-RI-TR-89-30, Carnegie-Mellon University, Dec. 1989, pp. 1-56.
J. Tsitsiklis, "Special Cases of Traveling Salesman and Repairman Problems with Time Windows," Report LIDS-P-1987, Massachusetts Institute of Technology, Jun. 1990, pp. 1-23.
W. Chiang, and M.S. Fox, "Protection Against Uncertainty in a Deterministic Schedule," in Proceedings of the Fourth International Conference on Expert Systems in Production and Operations Management, Hilton Head, South Carolina, May 1990, pp. 184-196.
D. Whitley, T. Starkweather, and D. Shaner, "The Traveling Salesman and Sequence Scheduling: Quality Solutions Using Genetic Edge Recombination," Handbook of Genetic Algorithms, Chapter 22, 1991, pp. 350-372.
M. Zweben, "Constraint-Based Simulated Annealing: An Iterative Improvement Framework for Constraint Satisfaction Search," NASA Ames Research Center, Moffett Field, California, Aug. 9, 1990, pp. 1-13.
M. Zweben, M. Deale, and R. Gargan, "Anytime Rescheduling," in Proceedings of a Workshop on Innovative Approaches to Planning, Scheduling and Control, San Diego, California, Nov. 5-8, 1990, pp. 251-259.

ART-UNIT: 271

PRIMARY-EXAMINER: Poinvil; Frantzy

ATTY-AGENT-FIRM: Shumaker; Steven J. Bauer; William D.

ABSTRACT:

A system and method for assigning and scheduling resource requests to resource providers use a modified "best-first" search technique that combines optimization, artificial intelligence, and constraint-processing to arrive at near-optimal assignment and scheduling solutions. In response to changes in a dynamic resource environment, potential changes to an existing assignment set are evaluated in a search for a better solution. New calls are assigned and scheduled as they are received, and the assignment set is readjusted as the field service environment changes, resulting in global optimization. Each search operation is in response to either an incremental change to the assignment set such as adding a new resource request, removing a pending resource request, reassigning a pending resource request, or to a request for further evaluation. Thus, the search technique assumes that the existing assignment set is already optimized, and limits the task only to evaluating the effects of the incremental change. In addition, each search operation produces a complete assignment and scheduling solution. Consequently, the search can be terminated to accept the best solution generated so far, making the technique an "anytime" search.

37 Claims, 10 Drawing figures

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L1: Entry 8 of 10 File: USPT Jan 17, 1989

US-PAT-NO: 4799162
DOCUMENT-IDENTIFIER: US 4799162 A
**** See image for Certificate of Correction ****

TITLE: Route bus service controlling system

DATE-ISSUED: January 17, 1989

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Shinkawa; Kiyoshi	Hyogo			JP
Kawahara; Takeshi	Hyogo			JP
Hayakawa; Hideki	Hyogo			JP
Mori; Masaru	Hyogo			JP

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Mitsubishi Denki Kabushiki Kaisha	Tokyo			JP	03

APPL-NO: 06/ 923093 [PALM]
DATE FILED: October 24, 1986

FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	APPL-DATE
JP	60-239056	October 25, 1985
JP	60-239058	October 25, 1985
JP	60-244544	October 29, 1985
JP	60-244545	October 29, 1985
JP	60-249611	November 6, 1985
JP	61-62054	March 18, 1986

INT-CL: [04] G06F 15/48, G08G 1/01

US-CL-ISSUED: 364/436; 340/994, 340/910
US-CL-CURRENT: 701/117; 340/910, 340/994

FIELD-OF-SEARCH: 364/436, 364/424, 340/916, 340/917, 340/994, 343/457

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected | Search ALL

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
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3662267	May 1975	Reed	340/993
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4092718	May 1978	Wendt	364/436
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4220946	September 1980	Henriot	340/994

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FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	US-CL
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Transportation Bureau of Tokyo Metropolitan Government, "Bus Location System".

ART-UNIT: 234

PRIMARY-EXAMINER: Lall; Parshotam S.

ASSISTANT-EXAMINER: Black; Thomas G.

ATTY-AGENT-FIRM: Bernard, Rothwell & Brown

ABSTRACT:

The route bus operation controlling system of this invention includes mobile radio units, ground radio unit and central processor, wherein the central processor is provided with a memory for storing the actual running time of buses in specific section of each bus service route and other service information and a processing unit which reads out the service information stored in the memory to calculate coefficient data which allows comparison among delays in each bus route, applies a weight to the calculated result basing on the old and new actual values, calculated as sample values the average movement values of buses which have run in the specified section, calculates as sample values the expected values of the bus under forecast, and cumulates the expected running time for each specified section, and wherein the mobile radio units and ground radio units are provided with display units for displaying service information of a specific section of route and the entire route.

6 Claims, 15 Drawing figures